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# AGE, LENGTH, AND BODY WEIGHT OF SALMON CAUGHT BY JAPANESE HIGH SEAS FLEETS IN NORTH PACIFIC

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United States Department of the Interior, Fred A. Seaton, Secretary
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# AGE, LENGTH, AND BODY WEIGHT OF SALMON CAUGHT BY JAPANESE HIGH-SEAS FLEETS IN NORTH PACIFIC

A PRELIMINARY REPORT

by

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Contribution No. 3 to research conducted with the approval of the United States Section of the International North Pacific Fisheries Commission. The Commission, established in 1953 by the International Convention for the High Seas Fisheries of the North Pacific Ocean, coordinates the research of the member nations: Japan, Canada, and the United States. The resulting investigations provide data to the Commission for use in carrying out its duties in connection with fishery conservation problems in the North Pacific Ocean. Publication of this scientific report has been approved by the United States Section of the Commission.

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## ABSTRACT

Data on the age composition of red salmon caught by the Japanese high-seas salmon fleets indicates the dominance of 2-year-in-ocean reds in the even years and 3-year-in-ocean reds in the odd years.

The majority of the 3-year-in-ocean reds are sexually mature. Some of the 2-year-in-ocean red salmon are mature fish but the proportion of mature and immature cannot be assigned at this time. More than 75 percent of the 1957 catch of red salmon were mature fish.

The majority of the 5-year-old chum salmon are sexually mature, while the 4-year-olds represent both immature and mature fish. In 1955 the majority of the chum salmon taken by this fishery were 4 years old; a significant number were immature. In 1956 the majority of the chum salmon were 5 years old and mostly mature.

The pink salmon available to the fishery were all mature fish.

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## INTRODUCTION

This report is an outline of the age composition, lengths, and weights of the Japanese high-seas catch and an interpretation of these data as they relate to the possible proportion of mature and immature fish contributing to their fishery.

## SOURCE OF DATA

The age composition data for 1955, 1956, and 1957, the fork length data for 1955 and 1956, and the body weight data for 1955 were taken from the Interim Reports on Research by the Japanese Fishery Agency for 1955, 1956, and 1957.

Age data for 1954 were obtained from information gathered by a U. S. Fish and Wildlife Service biologist aboard one of the Japanese motherships.

Body weights for 1956 were taken from data compiled from Japanese high-seas samples sent to the Seattle laboratory of the Pacific Salmon Investigations, U.S. Fish and Wildlife Service.

## THE DATA

### Red Salmon

Records to date indicate that red salmon spend a maximum of 4 years in the ocean before returning to spawn. These 4-year-in-ocean reds are absent in many river systems and where they occur, their incidence is less than 1 percent of the total run or catch. As the percentage of these 4-year-in-ocean reds returning to spawn is very small, and as the major spawners are 3-year-in-ocean reds (and even 2-year-in-ocean reds in some areas), we must regard all 4- and nearly all 3-year-in-ocean reds as mature fish, i.e., fish destined to spawn in the year caught.

In some systems such as the Fraser River, normally the majority of spawners are red salmon which have spent 2 years in the ocean. The Kvichak River (Bristol Bay) had a dominance of 2-year-in-ocean reds returning to spawn in 1956.

Data on the age composition of maturing reds in the river systems of the Asian continent are not available at the present time.

Examination of the age composition of red salmon caught by the Japanese high-seas fleet in figure 1 (1954-57) indicates the dominance of 2-year-in-ocean reds in even years and of 3-year-in-ocean reds for odd years. The majority of the 3-year-in-ocean reds caught by the Japanese fleet in both even and odd years were undoubtedly sexually mature fish.

Not all of the 2-year-in-ocean reds caught in the high-seas can be classified as mature fish, because some will probably remain in the ocean for another year to become the 3-year-in-ocean reds. Neither can all these 2-year-in-ocean reds be classified as being immature fish because, as previously stated, in some systems the majority of spawners are fish which have spent only 2 years in the ocean (e.g., Fraser River and Kvichak River, 1956).

In table 1 the age composition of the 1957 red salmon sampled aboard the motherships is expressed in percentages. By applying these percentages to the total red-salmon catch the catch of each age group was calculated. We may assume that most of the 3-year-in-ocean reds (15,100,000 fish) were mature. Twenty-four percent (4,700,000 2-year-in-ocean reds) represents the catch of mixed immature and mature fish in the 1957 high-seas catch. The actual percentage of immature red salmon was probably somewhat less than 24 percent.

The number of 1-year-in-ocean reds taken by the Japanese in any year is insignificant.

The average fork lengths (fig. 3) and average body weights (fig. 4) of red salmon sampled aboard 10 Japanese motherships in 1955 shows the decline in average length and average body weight during the month of August, even with a greater percentage of 3-year-in-ocean reds making up the total catch. The fishing area in August of 1955 is along the eastern coast of Kamchatka, and consequently until complete and accurate data can be obtained on the red salmon populations in the river systems of the Asian continent, no explanation can be given of the catch of small 3-year-in-ocean reds during August.

The average fork lengths and average body weights of red salmon caught in 1956 are shown in figures 5 and 7.

Chum Salmon

Analagous to the 3-year-in-ocean reds, most of the 5-year-old chums may be classified as sexually mature fish. The 6-year-old chums returning to spawn in any given year form a small percentage of the run. The 4-year-old chums fall into the same category as the 2-year-in-ocean reds. Depending on the system and locality, 4-year-old chums do return to spawn along with 5-year-olds and in instances may be the dominant age group of a run. Some 3-year-old chums are sexually mature especially in systems along the more southern area of the North American continent.

Information on the age composition of chums in systems of the Asian continent is lacking at present.

Examination of the age composition of chum salmon caught by the Japanese high-seas fleet in 1955 and 1956 (fig. 2) indicates that the 4- and 5-year-old chums dominate the total chum catch. In 1955 the fishery caught a predominance of 4-year-old chums, but in 1956 5-year-old chums were dominant. Since the dominant 5-year-old chums of 1956 were of the same brood year as the dominant 4-year-old chums of the previous year, we may assume that most of the 5-year-old chums caught were sexually mature fish. However, not all the 4-year-old chums can be classified as immature, because, depending on area of origin, many return to spawn in their fourth year. They also cannot all be mature fish; some would have to remain in the ocean for another year to become 5-year-old fish, as in the instance above where many 4-year-old chums of 1955 remained a year in the ocean to be caught as the dominant 5-year-old chums of 1956. Finally, not all 3-year-old chums caught in the high-seas can be classified as immature fish, although the probability that they are is great.

The average fork lengths (fig. 3) and average body weights (fig. 4) of chums caught in August of 1955 show a decline in both length and weight similar to that of the red salmon. Not even a tentative explanation of this condition is warranted at present nor of the similar decline of both chums and reds in length and weight during the period from late June to early July. The average fork lengths and weights of chum salmon caught in 1956 by the Japanese salmon fleet are shown in figures 6 and 7.

Pink Salmon

All pink salmon in any system or locality return to spawn in their second year, and consequently all pink salmon taken by the fishery are mature fish.

Figures 3 and 4 show the average fork lengths and average body weights of pink salmon caught by the Japanese in 1955. These figures show the general decrease in both length and weight of pinks from May to mid-June, and the general increase from late June to August. This decrease and increase in average fork lengths and average body weights indicates that this fishery is exploiting different populations of mature fish in its fishing movement from the eastern to the western North Pacific.

The mean body weights of pink salmon caught by the Japanese in 1956 are shown in figure 7.

## CONCLUSIONS

The majority of 3-year-in-ocean reds caught by the Japanese high-seas fishery in any year are sexually mature fish. The 2-year-in-ocean red salmon include both immature and mature fish and the proportion of each cannot be assigned at this time. However, more than 75 percent of the 1957 catch of red salmon were mature fish.

As the 5-year-old chum is comparable in maturity to the 3-year-in-ocean red, and the 4-year-old chum to the 2-year-in-ocean red, findings cited above also apply to the chum salmon. The data on hand do not permit ascertaining the proportion of 4-year-old chums attaining sexual maturity in the year of capture.

In 1955 the majority of the chum salmon were 4-year-in-ocean type and probably contained a significant number of immature fish. In 1956 the majority of the chum salmon were 5-year-in-ocean type and mostly mature.

The pink salmon which are available to the fishery are all mature fish.

Table 1.--Age composition of samples and calculated age composition of Pacific red salmon catch, 1957.

| Caught | Samples 1/ | | | | | High-seas catch 2/ | | |
|---|---|---|---|---|---|---|---|---|
| | Total number | 2-year Nbr. | % | 3-year Nbr. | % | Total number | Number of 2-year | Number of 3-year |
| May | 3221 | 418 | 13.0 | 2803 | 87.0 | 5,874,765 | 763,719 | 5,111,046 |
| June | 4330 | 1082 | 25.0 | 3248 | 75.0 | 10,322,415 | 2,580,604 | 7,741,811 |
| July | 2969 | 994 | 33.5 | 1975 | 66.5 | 3,604,711 | 1,207,578 | 2,397,133 |
| Total | 10520 | 2494 | 23.7 | 8026 | 76.3 | 19,801,891 | 4,693,048 | 15,108,843 |

1/ Samples taken aboard motherships by the Japanese Fishery Agency. Data taken from INPFC Document No. 118, "Interim Report on Salmon Investigations in the North Pacific in 1957 under the Research Program of the International North Pacific Fisheries Commission." September, 1957.

2/ Japanese high-seas fishery catch data on red salmon taken from INPFC Document No. 124, "1957 Salmon Catch by Japanese Mothership Fishery in Aleutian Waters, in Numbers of Fish."

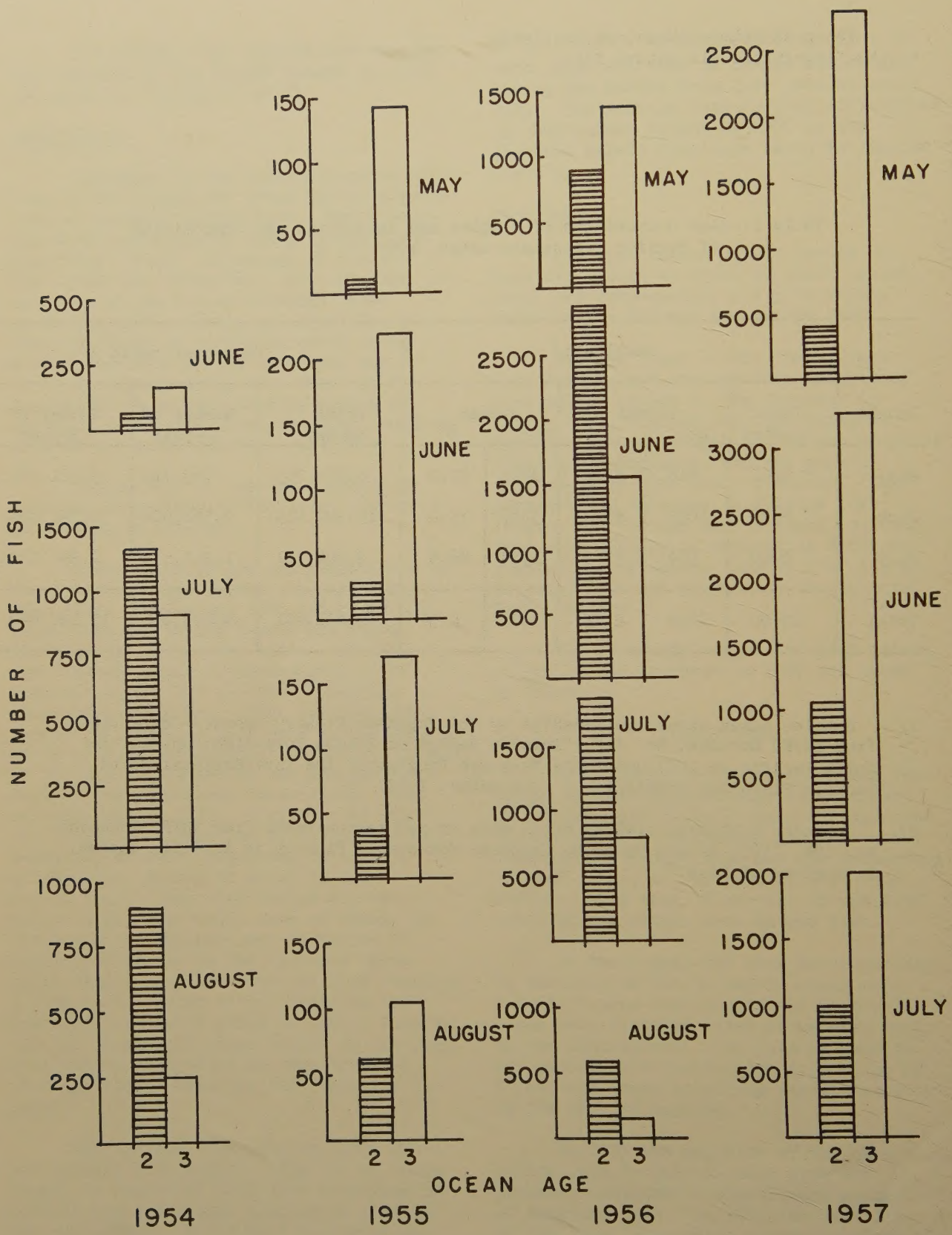


**Figure 1.**—Ocean age composition by months of red salmon sampled aboard Japanese motherships from 1954 to 1957.

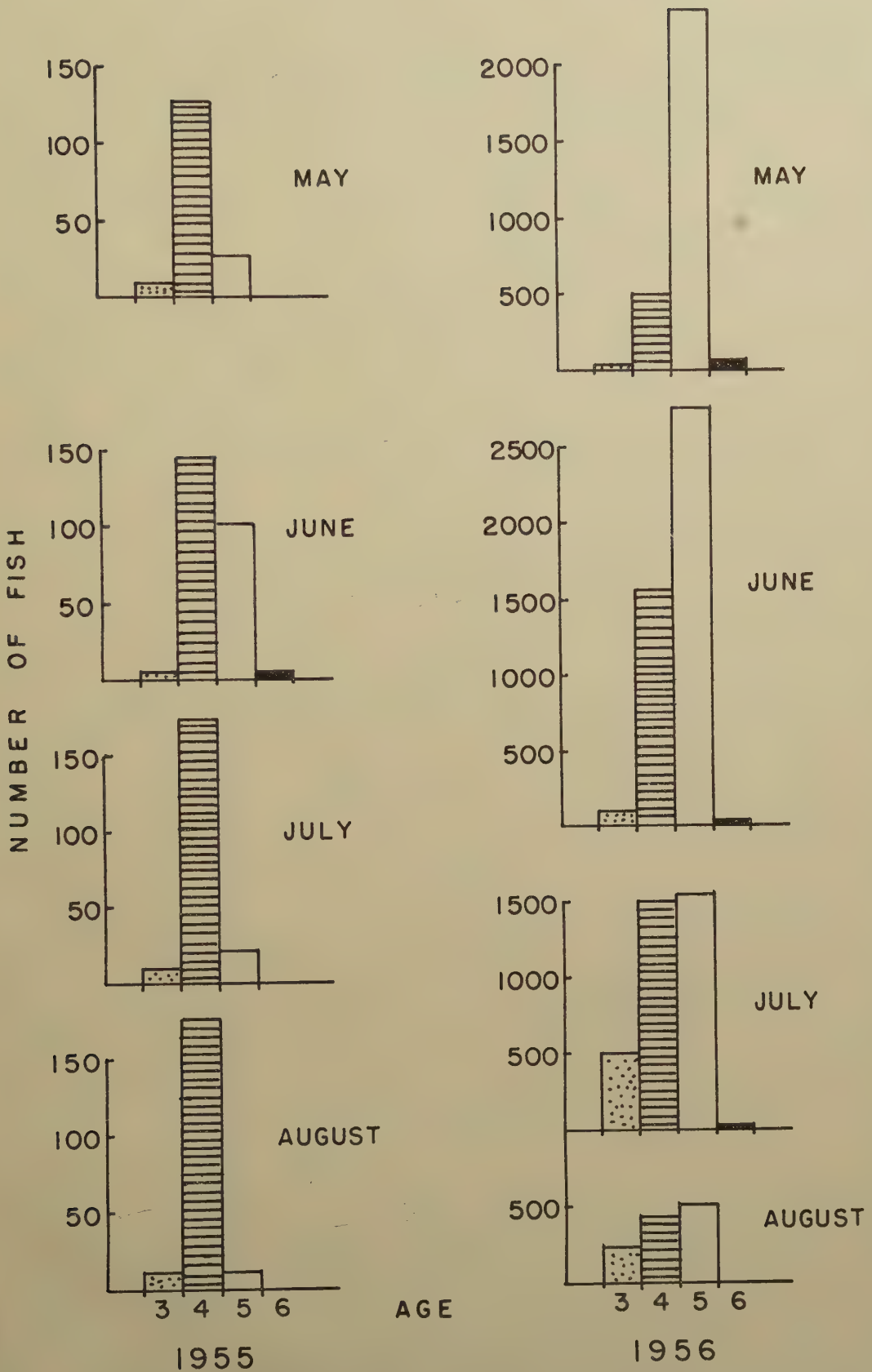


Figure 2.--Age composition by months of chum salmon sampled aboard Japanese motherships in 1955 and 1956.

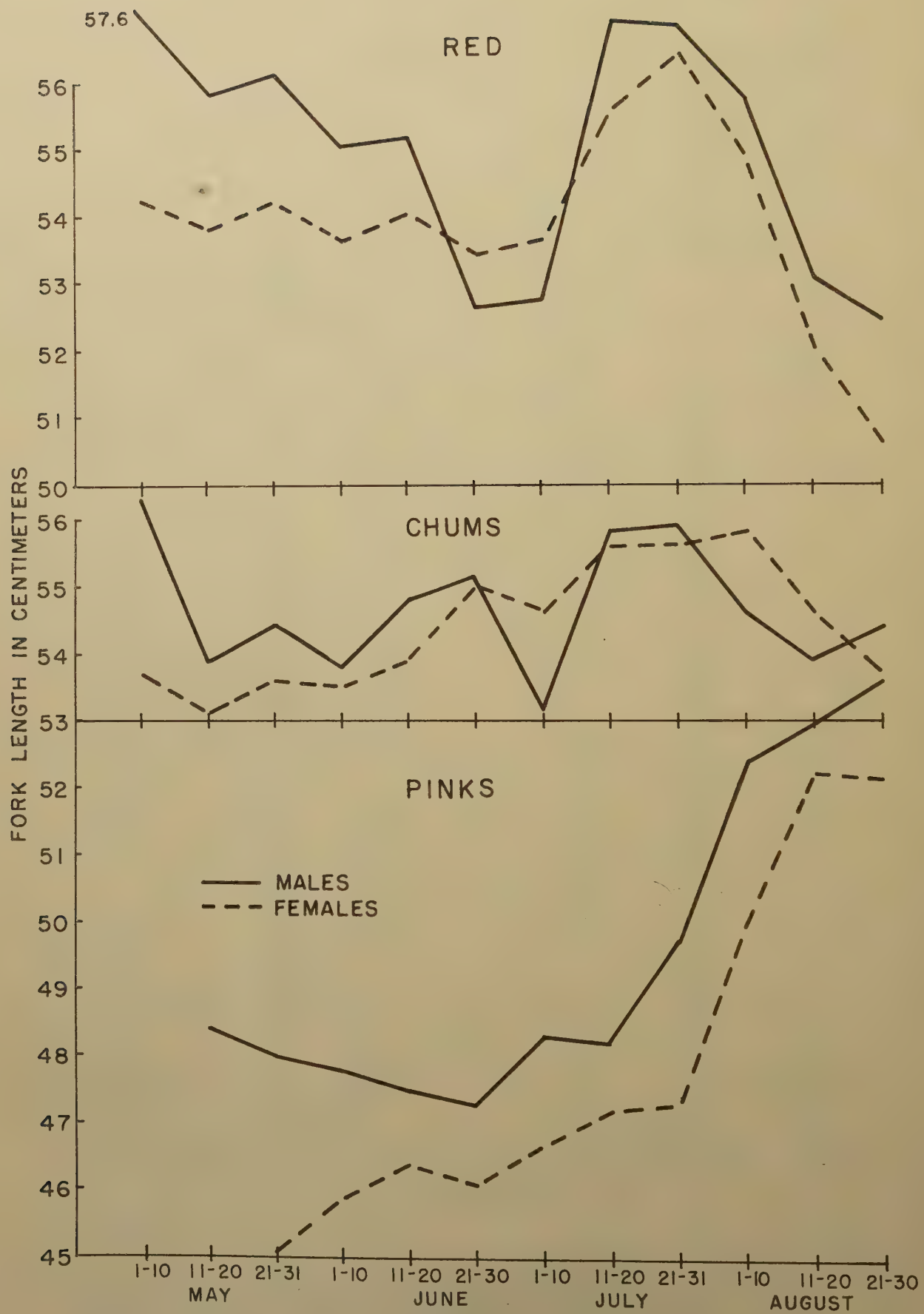


Figure 3.--Average fork lengths, by ten-day periods of red, chum and pink salmon sampled aboard ten Japanese motherships in 1955.

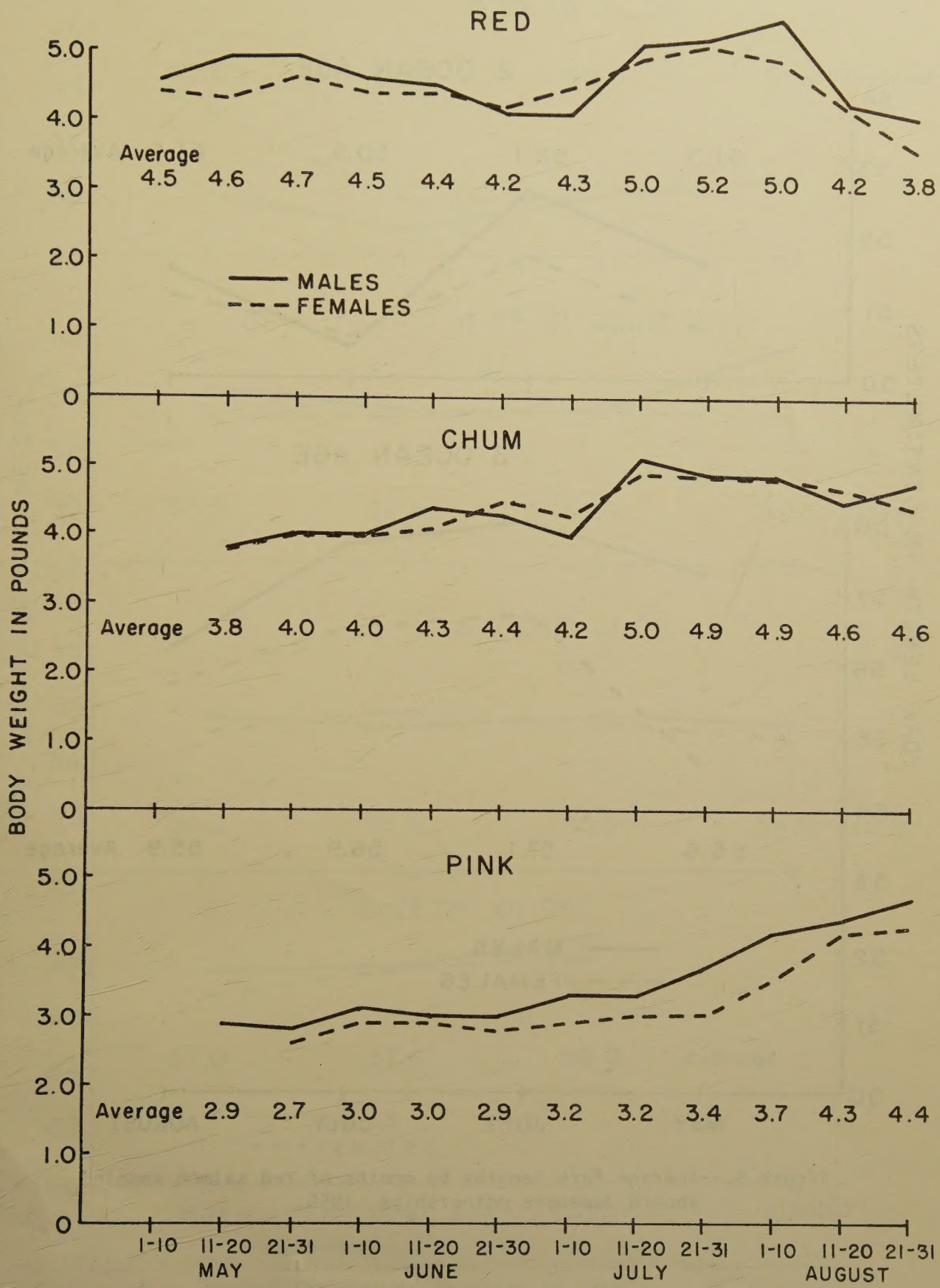


Figure 4.--Average body weights per ten-day periods of red, chum and pink salmon sampled aboard ten Japanese motherships in 1955.

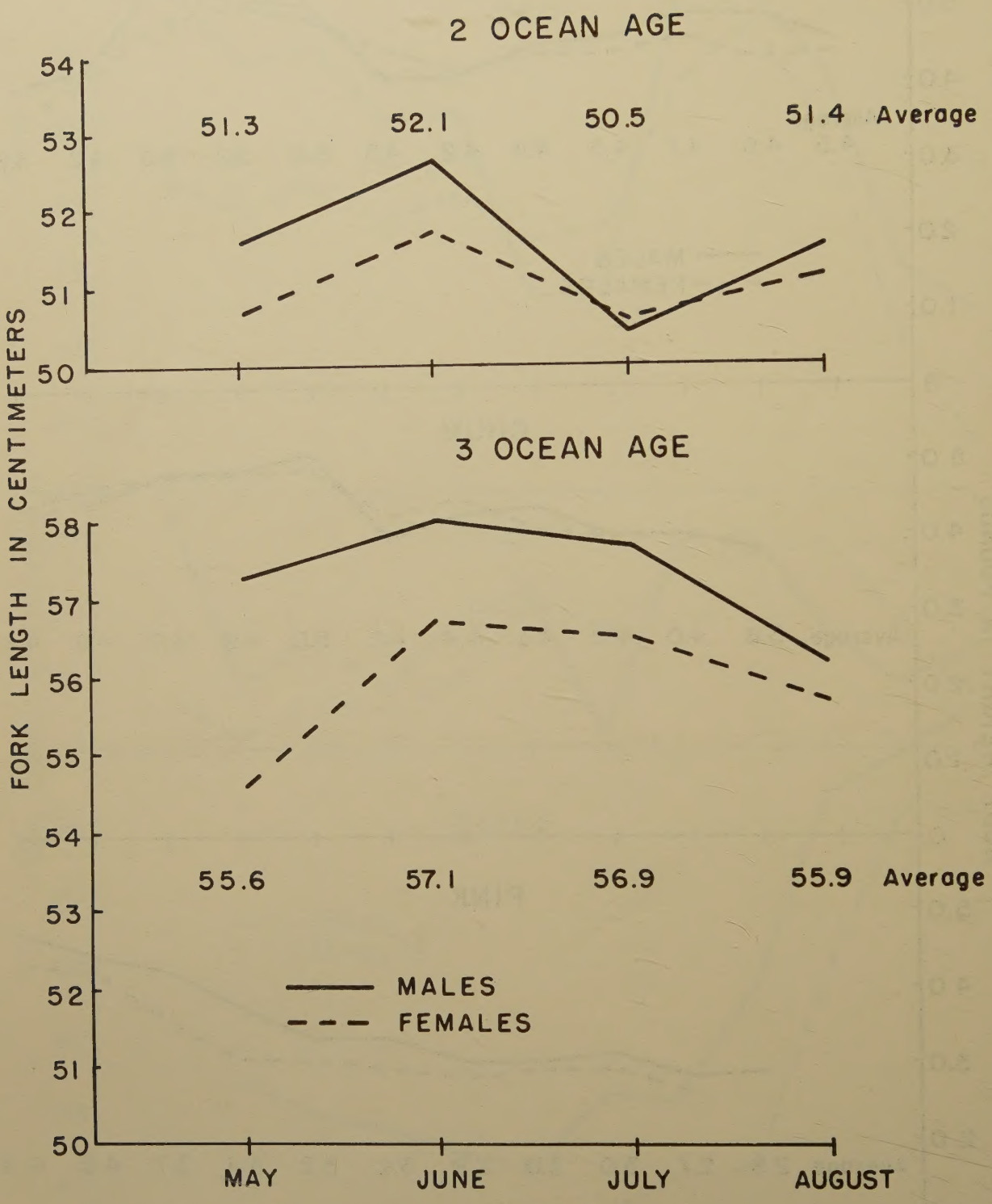


Figure 5.--Average fork lengths by months of red salmon sampled aboard Japanese motherships, 1956.

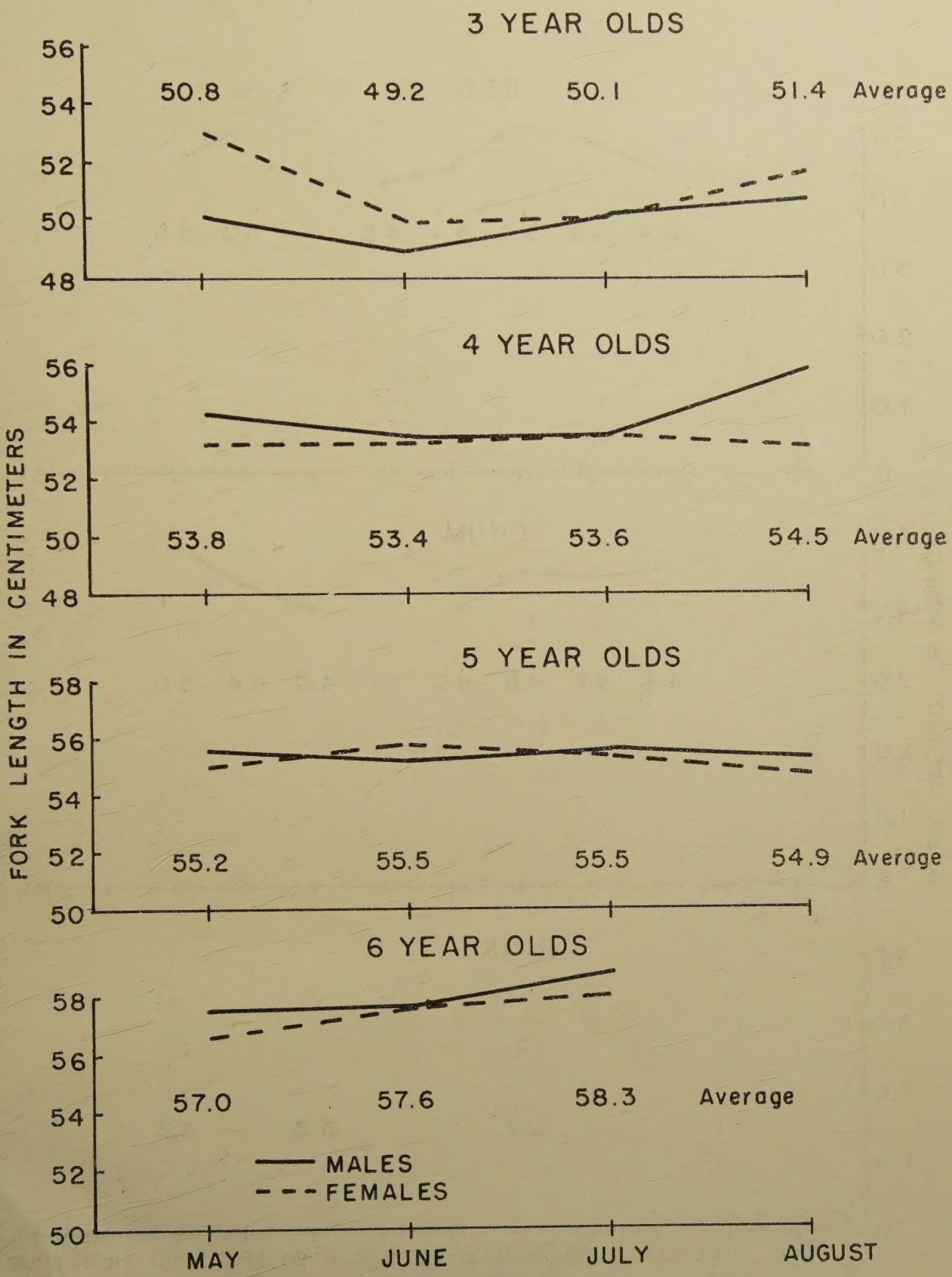


Figure 6.--Average fork lengths by months of chum salmon sampled aboard Japanese motherships in 1956.

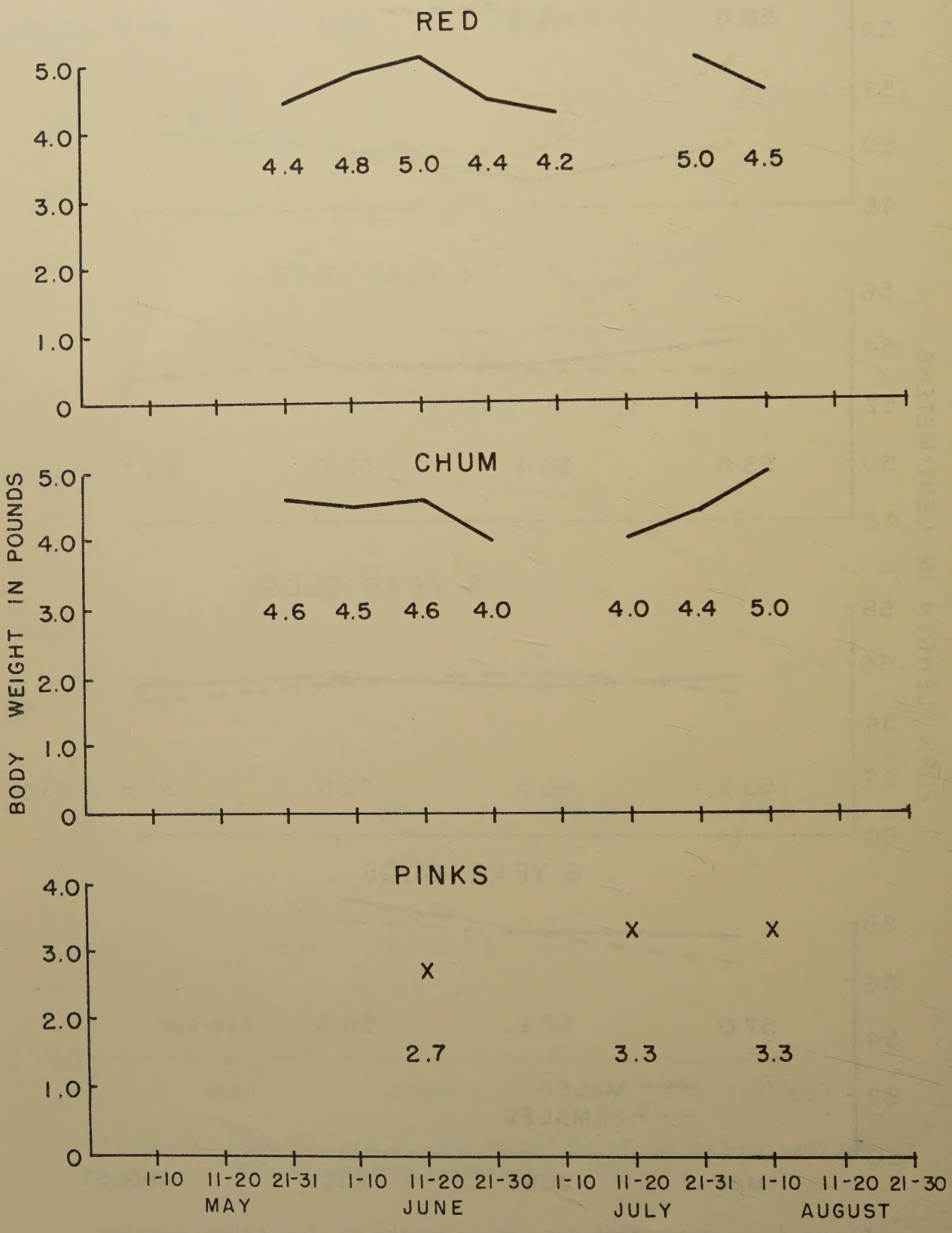


Figure 7.--Average body weights per ten-day periods of red, chum and pink salmon samples from two Japanese motherships in 1956.



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